

# Monkey Business In China Pays Off In Apples

GENEVA, N.Y., Phil Forsline and Herb Aldwinckle have won some hard-fought victories in their war against apple pests, but they met their match when confronted by rogue monkeys. The two were on a trip to China to collect wild apple germplasm when a band of primates attacked their party.

"One of them ripped my wife's poncho and grabbed her collecting bag," said Aldwinckle, a mild-mannered Brit who is the chairman of the U.S. Apple Germplasm Committee. "I yelled at him as loudly as I could. But when he stood up on his hind legs, screamed back at me with a blood-curdling screech and showed his fangs, we dropped our bags and got out of there as fast as we could walk."

The scientists ventured back about an hour later. They found their cloth bags ripped open and the small, bitter apples they had been collecting strewn about the forest floor.

The party of four Americans and four Chinese was on a two-week expedition to expand the apple collection at the USDA-ARS Plant Genetic Resources Unit (PGRU) at Geneva that is used for breeding and species preservation. At the time of the attack, they were 11,000 feet high in the mountains of Sichuan in central China on the Tibetan plateau, one of the most botanically diverse regions of the world.

Sichuan and neighboring provinces of China are considered the center of diversity for many wild species of apples that are important for the PGRU collection. The U.S. team, in cooperation with scientist from other countries, completed four expe-

ditions between 1989 and 1996 to the former U.S.S.R. in Central Asia to collect other wild apples more closely related to the commercial apple.

Forsline is curator of the PGRU apple collection at Geneva, the world's largest "living library" of apples, with some 5,000 apple trees representing 2,500 different accessions, among which are wild species, landraces, current cultivars and obsolete cultivars. Over 1,000 new additions including seed populations as well as selected elite clones from the wild habitats have been added to the collection from the five collecting trips.

Aldwinckle, a plant pathologist at Cornell, uses genetic material from these trips and the apple collection in the rootstock development program at the New York State Agricultural Experiment Station in Geneva that he runs jointly with a plant breeder, and has successfully developed rootstocks that are resistant to fire blight and phytophthora. Other researchers at the station and worldwide also use the material. The new collections are being evaluated at 25 different laboratories worldwide. On this trip to China, Aldwinckle and Forsline were accompanied by Laura Benson, a graduate student in plant breeding, Herb's wife Bernadine, and from four to eight Chinese cooperators, depending on the site.

Collecting wild germplasm is not easy. In addition to fighting monkeys, malaria, and mosquitoes, scientists have to adhere to strict governmental protocols, systematically keep track of the material they collect, and protect it during the long trip. To

arrange the China trip, for instance, permitting procedures had to be filed with the Chinese Ministry of Agriculture, the forestry department, the provincial governments of the provinces, and local administrative district's foreign affairs office. Researchers from New York were not allowed to pick the fruit from the trees. That privilege was granted to their Chinese colleagues, especially professor Li Yunong, of the Southwest Agricultural University in Bei Bei, Chongqing, and his associate, Zhou Zhiqin, who were authorized to collect seven of the 15 species the party requested. "Li and Zhou were very helpful," said Aldwinckle. The party collected apples in five different ecosystems throughout Sichuan.

The trip was funded by a grant from the USDA, which funds germplasm collection trips around the world. Members of the group hope to return to other areas of China to collect samples in the fall of 1999.

To preserve the diversity of the apple gene pool, scientists and plant explorers from the Experiment Station and the U.S.D.A. have trekked the world in search of primitive varieties and wild relatives. Prospecting for apple germplasm is like prospecting for green gold. Germplasm contains important genetic traits that have the potential to boost disease and insect resistance, increase yield, and improve quality. Apple germplasm is the product of millions of years of evolution, thousands of years of selection by humans, and scarcely 100 years of scientific plant breeding. With it, researchers can help fight epidemics of pests and

pathogens that threaten the security of the world's apple supply.

"Wild germplasm is critical in maintaining diversity in the gene pool," Forsline explains. If a new strain of disease or insect comes along that decimates current commercial varieties like McIntosh or Gala, for instance, germplasm which has evolved desirable traits through natural selection might provide genes for resistance that could be bred into future varieties.

Apple explorations have taken Aldwinckle and Forsline and other U.S. and international researchers to Kazakhstan and neighboring former U.S.S.R. states in search of *Malus sieversii*, which is a wild relative of the cultivate apple (*Malus domestica*). Since the first trip in 1989, Aldwinckle and Forsline have been collaborating to evaluate *M. sieversii* for resistance to apple scab, cedar apple rust, and fire blight.

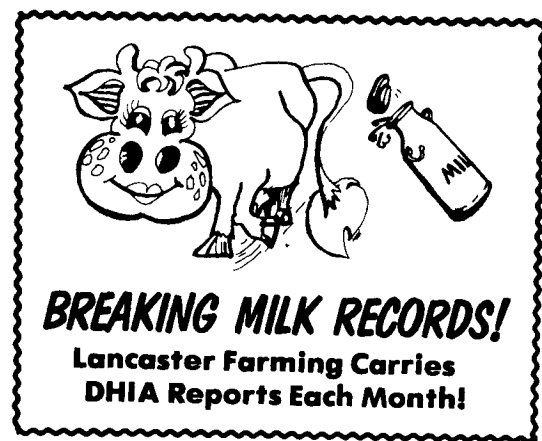
Researchers now think that apples originated in Central Asia and then migrated along trade, silk, and spice routes into the Middle East and Then Western Europe, making adap-

tations all along the way. Wild apples in Central Asia range up to a full pound in weight; in color from white to yellow, green and red; in taste from sweet to bitter; and in tree form from single to multi-trunked, to bush-like. Apples from China were mostly very small and bitter with diverse leaf forms but have other valuable genetic traits.

Aldwinckle, Forsline, and Benson are just beginning to evaluate the material they systematically collected in China and—despite the monkey business—consider the trip a great success.

"We are very encouraged by our initial sampling of the Chinese germplasm," said Forsline. "There appears to be many traits that will be especially useful in developing new rootstocks, particularly."

PGRU and the Cornell department of horticultural sciences are in the process of hiring a new rootstock breeder who will be located at Geneva within the next few months. That person will cooperate very closely with Aldwinckle and Forsline's programs in utilizing these newly collected genetic treasures.



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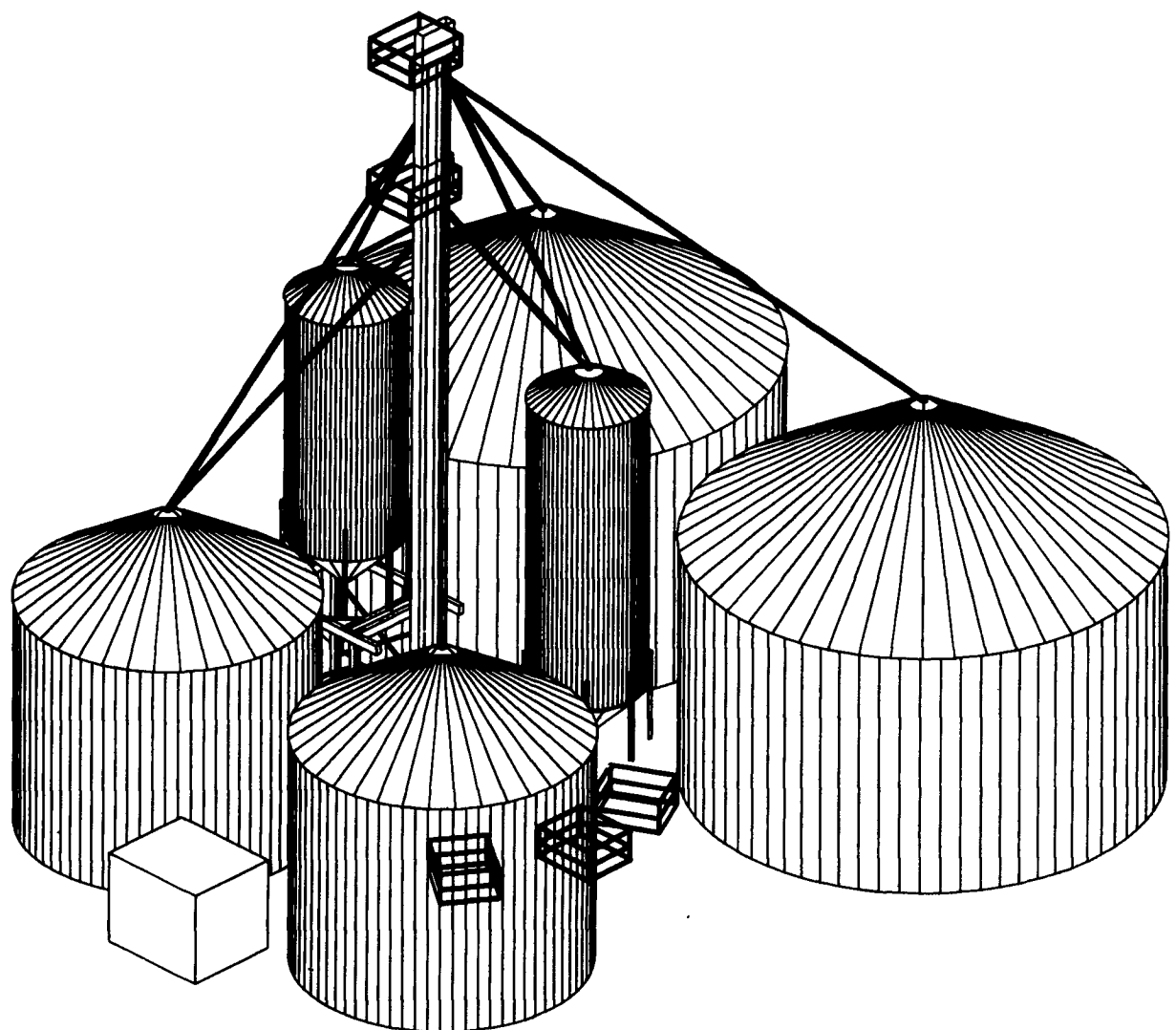
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